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SPECIFICATION FOR DETONATORS

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SPECIFICATION FOR DETONATORS

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Indian Standard

SPECIFICATION FOR DETONATORS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 9 May 1975, after the draft finalized by the Explosives and Pyrotechnics Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard requires reference to IS : 6609 (Part III)-1973* which is a necessary adjunct to it.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for detonators used for blasting purposes.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definition shall apply.

2.1 Permitted Detonators — Under the coal mines regulation, only detonators which have been approved by the Director General of Mines Safety are used in any mine in which approved safety lamps are required to be used. Such detonators are termed as permitted detonators and these include electric detonators for simultaneous firing, and also delay detonators.

3. GRADES

3.1 The detonators shall be of two grades, namely:

Grade A — General, and
Grade B — Permitted.

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*Methods of test for commercial blasting explosives and accessories: Part III Detonators, general and permitted.

†Rules for rounding off numerical values (*revised*).

4. TYPES

4.1 Depending upon the conditions of use and type of construction, the detonators shall be of the following types :

Grade A — General:

Type A-1 Plain (ordinary) detonators
Type A-2 Instantaneous electric detonators
Type A-3 Delay electric detonators

Grade B — Permitted:

Type B-1 Instantaneous electric detonators
Type B-2 Delay electric detonators

4.2 Under each type, the detonators shall be of two strengths, namely, No. 6 and No. 8.

5. REQUIREMENTS

5.1 For Type A-1

5.1.1 *Drop Test* — When Type A-1 detonators are subjected to drop test as laid down in **2.2** of IS : 6609 (Part III)-1973* none of the detonators shall detonate nor there shall be any loose composition inside the tubes.

5.1.2 *Vibration Test* — When Type A-1 detonators are subjected to vibration test as laid down in **2.4** of IS : 6609 (Part III)-1973* and examined visually, there shall neither be any loose composition inside the tubes nor it shall come out of the tube during the testing and the detonators shall not explode during the test.

5.1.3 *Strength*

5.1.3.1 *By sand bomb method* — When Type A-1 detonators are tested in sand bomb as prescribed in **2.5** of IS : 6609 (Part III)-1973*, the percentage of crushed sand passing through 500-micron and 250-micron IS Sieves shall be as follows :

Strength of Detonator	*Percentage of Sand Passing Through*	
	500-micron IS Sieve	250-micron IS Sieve
No. 6	Not less than 35	Not more than 30
No. 8	Not less than 50	Not more than 45

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5.1.3.2 *By lead plate method* — When Type A-1 detonators are subjected to test as laid down in **2.6** of IS : 6609 (Part III)-1973* they shall produce dent on the lead plate corresponding to at least C-3 class of the standard.

5.2 For Type A-2

5.2.1 *Drop Test* — same as prescribed in **5.1.1**.

5.2.2 *Snatch Test* — When Type A-2 detonators are subjected to the snatch test as laid down in **2.3** of IS : 6609 (Part III)-1973* these shall not fire when a jerk is applied to the lead wires.

5.2.3 *Strength* — same as prescribed in **5.1.3.1** and **5.1.3.2**.

5.2.4 *Water Resistance* — When Type A-2 detonators are subjected to water resistance test as laid down in **2.1** of IS : 6609 (Part III)-1973*, they shall give the same performance when tested by the method prescribed in **2.6** of IS : 6609 (Part III)-1973* and shall conform to the indentation as prescribed in **5.1.3.2**.

5.2.5 *Electrical Resistance* — When Type A-2 detonators are subjected to electrical resistance measurement as laid down in **2.7** of IS : 6609 (Part III)-1973*, the value shall lie within the range specified by the manufacturer.

5.2.6 *No Fire Current* — When Type A-2 detonators are subjected to no fire current test at 180 mA and for 50 ms as laid down in **2.8** of IS : 6609 (Part III)-1973*, they shall not fire.

5.2.7 *Series Firing Test* — When 10 Type A-2 detonators are subjected to the series firing test as laid down in **2.9** of IS : 6609 (Part III)-1973*, all the detonators shall fire successfully with the current and within the application time of the current as specified by the manufacturer.

5.3 For Type A-3

5.3.1 *Drop Test* — same as prescribed in **5.1.1**.

5.3.2 *Snatch Test* — same as prescribed in **5.2.2**.

5.3.3 *Strength* — same as prescribed in **5.1.3.1** and **5.1.3.2**.

5.3.4 *Water Resistance* — same as prescribed in **5.2.4**.

5.3.5 *Electrical Resistance* — same as prescribed in **5.2.5**.

5.3.6 *No Fire Current* — same as prescribed in **5.2.6**.

5.3.7 *Series Firing Test* — same as prescribed in **5.2.7**.

5.3.8 *Delay Time Measurement* — The manufacturer shall declare the nominal delay interval for each delay of the different types of delay detonators. In delay time measurement, the scatter of any particular delay number of any type shall be such that not more than 5 percent of the detonators

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tested shall have delay timing overlapping with the delay timing of the adjacent numbers.

5.4 For Grade B (Permitted Detonators)

5.4.1 *Drop Test* — same as prescribed in **5.1.1.**

5.4.2 *Snatch Test* — same as prescribed in **5.2.2.**

5.4.3 *Strength* — same as prescribed in **5.1.3.1** and **5.1.3.2.**

5.4.4 *Water Resistance* — same as prescribed in **5.2.4.**

5.4.5 *Electrical Resistance* — same as prescribed in **5.2.5.**

5.4.6 *No Fire Current* — same as prescribed in **5.2.6.**

5.4.7 *Series Firing Test* — same as prescribed in **5.2.7.**

5.4.8 *Delay Time Measurement* (*For Type B-2 only*) — same as prescribed in **5.3.8.**

5.4.9 *Gas Incendivity* — When Type B-1 detonators are subjected to gas incendivity test as laid down in **3.2** of IS : 6609 (Part III)-1973*, they shall not cause more than 14 gas ignitions in 200 tests. In case of Type B-2, 200 detonators of each delay shall be tested and none of the individual delay shall cause more than 14 gas ignitions.

NOTE — Gas incendivity test is a type test and it is not required to be carried out on every lot if the particular type of construction has been tested by Central Mining Research Station and approved by Directorate General of Mines Safety.

6. PACKING AND MARKING

6.1 Packing — The detonators shall be packed as agreed to between the purchaser and the supplier. The packing shall conform to the provisions of Explosives Rules, 1940.

6.2 Marking — Each package shall be marked with the following information:

a) Name, grade, type and strength of the material;
b) Number of pieces in the package;
c) Manufacturer's name and/or his recognized trade-mark, if any; and
d) Date of manufacture and lot number to enable the batch of manufacture to be traced from records.

6.2.1 The package shall also be marked with the appropriate symbol specified in IS : 1260 (Part I)-1973†.

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†Pictorial markings for handling and labelling of goods: Part I Dangerous goods (*first revision*).

6.2.2 In case of Grade A detonators, the cases shall also be clearly marked 'NOT FOR USE IN GASSY MINES'.

6.2.3 The marking shall further be in conformity to the provisions of Explosives Rules, 1940.

6.2.4 The cases may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

7. SAMPLING

7.1 Lot — Cases of detonators of same grade, same type and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

7.1.1 Detonators constituting the sample shall be drawn from each lot separately for deciding the conformity of the lot to the requirements of the specification.

7.2 Plain (Ordinary) Detonators

7.2.1 Number of detonators to be selected at random from the lot shall depend on the lot size and shall be in accordance with col 2 of Table 1. In order to ensure randomness of selection, procedures given in IS : 4905-1968* may be followed.

TABLE 1 SCALE OF SAMPLING OF PLAIN (ORDINARY) DETONATORS

Approximate Number of Detonators in the Lot	Sample Size
(1)	(2)
Up to 10 000	50
10 001 to 25 000	100
25 001 and above	125

7.2.1.1 At least 25 percent cases shall be sampled and equal number of detonators drawn from each case to constitute the sample of the required size.

*Methods for random sampling.

7.2.2 *Number of Tests* — The number of detonators to be drawn from each lot for carrying out various tests, shall be as given below:

Test	*Number of Detonators to be Tested*
Drop test	10
Vibration test	20
Strength by lead plate method or by sand bomb method	5

7.2.3 *Criteria for Conformity* — For deciding the conformity of the lot to the requirements of this specification, the test results of each characteristic shall meet the corresponding requirements specified in the relevant clauses.

7.3 Instantaneous Electric (Aluminium or Copper) Detonators and Delay Electric Detonators

7.3.1 The number of detonators to be selected shall be according to Table 2.

TABLE 2 SCALE OF SAMPLING OF INSTANTANEOUS ELECTRIC (ALUMINIUM OR COPPER) DETONATORS AND DELAY ELECTRIC DETONATORS

Approximate Number of Detonators in the Lot	Sample Size
(1)	(2)
Up to 10 000	100
10 001 to 25 000	200
25 001 and above	250

7.3.2 *Number of Tests for Instantaneous Electric (Aluminium or Copper) Detonators* — The number of detonators taken for the determination of each characteristic shall be as given below:

Sl No.	*Test/Characteristic*	*No. of Detonators to be Tested*
i)	Water resistance	5
ii)	Drop test	5
iii)	Snatch test	5
iv)	Strength by lead plate or by sand bomb method	5
v)	Electrical resistance	5
vi)	No fire current	10
vii)	Series firing (10 detonators in series)	20

7.3.3 *Number of Tests for Delay Electric Detonators* — The number of detonators taken for determination of each characteristic is given below:

Sl No.	*Test/Characteristic*	*No. of Detonators to be Tested*
i)	Water resistance	5
ii)	Drop test	5
iii)	Snatch test	5
iv)	Vibration test	20
v)	Strength by lead plate method or sand bomb method	5
vi)	Electrical resistance	5
vii)	No fire current	10
viii)	Series firing (10 detonators in series)	20
ix)	Delay timing	20

7.3.4 *Criteria for Conformity for Instantaneous Electric (Aluminium or Copper) Detonators and Delay Detonators* — For declaring the conformity of the lot to the requirements of the specification, the test results of each of the above characteristics shall meet the corresponding requirements in the relevant clauses.

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